City of Memphis
TENNESSEE

JIM STRICKLAND
MAYOR

DIVISION OF PUBLIC WORKS
ENVIRONMENTAL ENGINEERING

April 29, 2016

Tisha Calabrese Benton, Director
Division of Water Resources
Department of Environment and Conservation
312 Rosa L. Parks Ave., 11th Floor
Nashville, TN 37243

Dear Director Benton,

This letter is written in response to the Notice of Violation (NOV) issued to the City of Memphis , dated April 18, 2016, regarding the sanitary sewer discharge into South Cypress Creek and McKellar Lake. The NOV identified required actions to be addressed as part of the response and project management phase of this incident. It is the City's intent to fully comply with your directives to the extent practicable, and we look forward to resolution of this matter. The following is provided as the City's response to the NOV:

- Communicate with the Division regarding ongoing repair, remediation, water quality sampling, and related issues on a daily basis until further notice. This communication should, at a minimum, be accomplished by email and sent to the manager of the Division's Memphis Office, Joellyn Brazile (Joellyn.Brazile@tn.gov) and the manager of the Division's Compliance and Enforcement Unit, Jessica Murphy (Jessica.Murphy@tn.gov), with a copy to Stephanie Durman in the Office of General Counsel (Stephanie.Durman@tn.gov).

  Response: City staff has and will continue to be open and transparent in all transactions and actions taken during this important project. Contractors have been instructed to share sampling data and/or any information that will be beneficial to TDEC.

- Maintain communications with the public regarding the contact advisory of McKellar Lake and the lower portion of South Cypress Creek to discourage recreational use until the health threat is alleviated.

  Response: The City acknowledges the importance of this communication to the public and will continue to aggressively reach out through appropriate venues as necessary. An update will be provided to the public at the MLGW Neighborhood Advisory Council on May 10, 2016.

- Continue to remove and properly dispose of dead fish in the two areas on the sandy shores of Treasure Island where fish have accumulated, the inlet between Nonnconnah Creek and South Cypress Creek, and other areas as directed in writing.

125 North Main Street ♦ Room 620 ♦ Memphis, Tennessee 38103-2091 ♦ (901) 576-7125 ♦ FAX (901) 576-7119

Response: The City hired River Services, New Orleans, LA., to recover and properly dispose of dead fish from those areas identified by TDEC. The contractor deployed three 25 foot boats, two floating platforms for staging and six employees to recover the fish. The physical state of the fish, terrain and water levels made the task very difficult, however crews worked diligently to accomplish as much as possible.

- On or before May 2, 2016, submit a remediation plan to the Division for review. The remediation plan at a minimum should include how the City plans to:

  - Reduce E.coli levels in the affected waterbodies to pre-impact conditions;
  - Return dissolved oxygen levels to pre-impact conditions;
  - Remove solids associated with the wastewater discharge that have accumulated on the bottom and banks of the affected waterbodies;
  - Remove and dispose of the fish that have died due to this event; and
  - Effectively communicate the health situation to the general public;

  Response: The City has retained Katie Bell, Ph.D., P.E., BCEE, MWH, to research feasible and realistic approaches to address the remediation component of the project. Dr. Bell's proposal addressing each of the above items is attached as ATTACHMENT 1.

- On or before May 2, 2016, submit a corrective action plan (CAP) to permanently repair or replace the broken line, including measures to prevent future line breakage due to bank instability and identification of any proposed alterations to waters of the state as a result of corrective actions outlined in the plan.

  Response: The City has retained Allen & Hoshall, Inc. to design the replacement of the broken line. The design plans are included as ATTACHMENT 2. The design plans included are at approximately 90% complete. The plans include sheet piling and rip rap to stabilize the area so the pipe can be installed as well as preventing future erosion of the bank. Alterations to waters of the state are required for this emergency maintenance project. A 0.43 acre wetland within the northern portion of the site was partially impacted by the repair work. The sewer line is being put back in the same location along with the riprap that was already in place. Once earth moving activities have been completed, the altered portion of the wetland will be returned to its original contours. Wetland vegetation will naturally reestablish from the seed bank and from the dispersal of seeds from vegetation in the adjacent wetland areas. In order to prevent further erosion, it is necessary to stabilize the base and banks of South Cypress Creek. However, cumulative impacts will be kept to the least amount necessary to stabilize the base and banks of South Cypress Creek.

- On or before May 2, 2016, submit a description of any alterations to waters of the state (i.e., South Cypress Creek and associated wetlands) that were necessary to remedy the emergency situation.

  Response : The City retained Brophy-Heineke & Associates, Inc., to assess the area for wetlands and other "waters" subject to 404/401 regulations by the US Army Corps of Engineers and/or TDEC , see ATTACHMENT 3.

- On or before July 15, 2016, survey the entire Memphis sewage collection system to identify any other locations(s) where a line breakage due to erosion/bank instability is possible and a list of each such location, including the size of the affected pipe and the receiving waters.

  Response: In response to the Sanitary Sewer Discharge into South Cypress Creek and McKellar Lake, the City of Memphis has implemented an extensive overland survey of all sewer lines that could be susceptible to erosion or bank instability. The entire lengths of the interceptors are currently under inspection by designated City of Memphis crews. To start the overland survey, GIS has been used to identify all lines within 100 feet of any receiving stream or tributary. These lines were determined as susceptible to erosion or bank instability. These lines have been divided into two phases for the purpose of implementing this survey. Phase 1 consists of all lines 24"and larger and is currently being conducted by SARP10 teams that work under contract for the City of Memphis. Phase 2 will consist of all lines under 24". The survey will consist of a manhole to manhole inspection looking for any cavities, erosion, and manhole defects. Photo documentation and a data based record of all defects and site conditions both good and bad will be kept. A distance measurement will be taken from the top of the bank to the closest point along the pipe segment, and pipes crossing any stream or tributary are also being identified. These measurements will help to monitor changing conditions and further develop inspection and maintenance programs. An application is in beta testing for all information to be electronically stored and field inspections to be logged in tablets for analysis. July 15, 2016 is the scheduled completion date for all lines to be inspected with compiled lists of locations that are most susceptible to erosion or bank instability along with pipe diameters and receiving waters. This survey will be undertaken contemporaneously with the continued assessment of priority rehab areas as established by the Consent Decree entered into by the City with the EPA, TDEC, and TCWN.

The City of Memphis greatly appreciates TDEC's continued cooperation with regard to this matter. To the extent you have any questions or comments, please feel free to contact me directly.

Sincerely,

Paul Patterson
Administrator of Environmental Engineering

Attachments (3)

cc: Robert Knecht
Bruce McMullen
Scott Morgan
George Garden
Stephanie Durman
Jessica Murphy
Joellyn Brazile

ATTACHMENT 1

MWH

BUILDING A BETTER WORLD

To: Paul Patterson, City of Memphis

From: Kati Bell, Ph.D., P.E., BCEE, MWH

Date: April 26, 2016

Re: Lake McKellar Remediation Plan

CC: Scott Morgan, P.E., City of Memphis
Zack Daniel, P.E., BCEE, CDM

The Tennessee Division of Water Resources (Division), on April 18, 2016 issued a Notice of Violation (NOV) to the City of Memphis ("City") in response to the March 31, 2016 sewer line break in the Nonconnah Interceptor near Lake McKellar. The line break resulted in a release of approximately 350MG of raw wastewater into the mouth of South Cypress Creek and McKellar Lake. While is unusual for administrative orders to be issued in a NOV, it is understood that the City of Memphis would like to proactively address this issue and fully cooperate with the Division to the extent practicable. This document serves to address the stated requirements for the Remediation Plan that must be submitted by the City and specifically address the following:

- Reduce *E. coli* levels in the affected waterbodies to pre-impact conditions;
- Return dissolved oxygen levels to pre-impact conditions;
- Remove solids associated with the wastewater discharge that have accumulated on the bottom and banks of the affected waterbodies;
- Remove and dispose of the fish that have died due to this event; and
- Effectively communicate the health situation to the general public

Reduce *E. coli* levels in affected waterbodies to pre-impact conditions

While restoring the water quality of McKellar Lake is a goal of this plan, it is important to note that the lake was on the Tennessee 303d list as being impaired with respect to bacteria (specifically *E. coli*), as well as other criteria, prior to the referenced spill. Thus, while the City has already initiated a monitoring protocol for bacteria, it would be useful to obtain the data that was used in making the determination that Lake McKellar should be included on the 303d list. If the Division can provide this information, it will aid the City in establishing criteria for determining when this element of the plan has been met successfully.

The plan to address the human health risks associated with pathogen contact is to restrict public access to this area until microbial die-off and other natural inactivation mechanisms (e.g., sunlight) return ambient water concentrations to pre-impact conditions, as determined by the pre-impact water quality information requested above. Additional disinfection of the affected water is not recommended because disinfectants (and disinfection by-products) could also harm other aquatic organisms.

380 Interlocken Crescent
Suite 200
Broomfield, CO 80021

TEL 303 410 4100
FAX 303 410 4100
www.mwhglobal.com

The City will continue to monitor the *E. coli* concentrations in the vicinity of the spill, as currently being conducted by both TDEC and Black & Veatch (B&V) under a TDEC approved protocol. When the geometric mean of samples is within one half log or less than the pre-existing *E. coli* concentrations (to be provided by TDEC). Data for this task will be collected and compiled and a summary report will be included with the update reports to TDEC that will be provided according to the schedule outlined at the end of this plan.

Return dissolved oxygen levels to pre-impact conditions

While restoring the water quality of McKellar Lake is a goal of this plan, it is important to note that the lake was on the Tennessee 303d list as being impaired with respect to low dissolved oxygen prior to the referenced spill. Thus, while the City has already initiated a monitoring protocol for dissolved oxygen, it would be useful to obtain the data that was used in making the determination that Lake McKellar should be included on the 303d list for this impairment. If the Division can provide this information, it will aid the City in establishing criteria for determining when this element of the plan has been met successfully.

The City will continue to monitor the dissolved oxygen concentrations in the vicinity of the spill, as currently being conducted by both TDEC and Black & Veatch. When the dissolved oxygen concentrations in the lake are within 15-percent of the concentrations of the pre-existing dissolved oxygen concentrations (to be provided by TDEC), it will be assumed that this element of the plan has been successfully met. The monitoring that is currently ongoing will be supplemented by additional monitoring to include additional depth measurements at six (6) of the current monitoring points, that will be discussed in a conference call with the City of Memphis, TDEC, CDM/MWH and B&V. The additional monitoring parameters that will be collected at 1.5-foot depth intervals at the six locations are as follows:

- pH
- ORP
- Conductivity
- D.O.
- Temperature

Following implementation of a baseline monitoring program, as scheduled in Table 1 (included at the end of this document), a hypolimnetic reoxygenation system will be deployed to begin to add supplemental oxygen into the lake at lower levels. This is important because in the southeast, it is common that lakes and reservoirs are thermally stratified, meaning that in warm periods of the year, cold water is found at the bottom of the lake/reservoir and, warm water is found at the top with a temperature gradient in between. In general, dead planktonic organisms, sediments, and other nutrients that have entered the water body near the surface will sink to the bottom of the water body and begin to decay; the decay rates and reactions will be a function of the dissolved oxygen available in the hypolimnion. The concern regarding the recent wastewater release is that an excess amount of carbon and nutrients will serve as a sink that will eventually become anaerobic.

As fall approaches, lower temperatures that prevail at night will eventually cool the surface (epilimnion) and this water will become denser. The cooler, dense water will sink past the thermocline to the bottom waters or the hypolimnion, causing mixing to achieve a uniform temperature throughout the water body. During this mixing process, the decaying matter including nutrients are redistributed throughout

the lake/reservoir. Thus, it is recommended to enhance the natural treatment process to restore the condition of the reservoir such that adequate oxygen is available to eliminate the excess organic carbon and nutrients that have been loaded to the water body from the wastewater release, prior to a lake destratification event. In the case of Lake McKellar, the lake is influenced by water levels in the Mississippi River and it is possible that a destratification event could occur as a result of inflows or outflows of water that impart energy into the system. Recognizing the urgency of addressing the depletion of dissolved oxygen in the area around the release, it is recommended to begin injecting oxygen into the system as soon as feasible. It is also important that addition of oxygen does not "mix" the waterbody, such as what could be observed with traditional surface mixing/aeration systems.

This issue of hypolimnetic reoxygenation is a common challenge throughout the US, and as a result, there are engineered systems that have been developed to accomplish reoxygenation without disrupting the thermal stratification of the waterbody. A typical example is hypolimnetic reaeration of lakes used for drinking water supplies; in an anoxic or anaerobic hypolimnion, settled materials such as iron and manganese become reduced and can disrupt water treatment. At Thunderbird Lake, Oklahoma, a system has been installed to specifically address this issue, as shown in Figure 1.

Figure 1. Hypolimnetic reaeration system at Lake Thunderbird, OK.

The system is based on the principles of Henry's Law, and is able to deliver gas into a liquid stream at greater than 95% mass transfer efficiency, by supersaturating a side stream of water from the same strata as the point of delivery. Because the gas is actually dissolved into solution, when it is reintroduced into the water body, no bubbles are released, minimizing the potential for mixing. Similar portable, trailer mounted systems are available for temporary applications, as shown in Figures 2a and 2b.

The proposed system for restoring the dissolved oxygen and water quality at Lake McKellar includes skid mounted SDOX® system, an oxygen supply, and a generator to provide power. The generator and SDOX® system would be mounted on a barge and floated to the central area of the spill, in South Cypress Creek, as shown in Figure 3. The system would be run to deliver approximately 2000 pounds per day of oxygen

back into the system; while it is not anticipated that the application point would need to be moved during the application, the system could be moved, as necessary and if indicated during monitoring. Considering the typical influent BOD at the TE Maxson WWTP, and the natural influx of dissolved oxygen, it is estimated that approximately two months of reaeration could achieve significant improvement of the water quality in the affected areas.


Figures 2a and 2b. Trailer mounted oxygen reaeration systems for temporary applications.

Remove solids associated with the wastewater discharge that have accumulated on the bottom and banks of the affected waterbodies

While the removal of solids associated with the wastewater discharge has been recommended by TDEC, it is also important to consider unanticipated ramifications of disturbing these solids. First, the raw wastewater is not anticipated to be hazardous aside of the fact that it may contain pathogens and BOD which can deplete dissolved oxygen concentrations in the lake. However, as demonstrated by the ability of the biological treatment system to degrade the constituents in the wastewater and yield biosolids that could be classified as Class A, if they are dried to the appropriate solids content – the wastewater, once treated is non-hazardous.

Considering that Lake McKellar is listed on Tennessee's 303d list for a range of contaminants, including mercury, chlordane, E. coli, sediments, nitrate+nitrite, etc. and the Tennessee Wildlife Resources Agency (TWRA) website (http://tennessee.gov/twra/article/contaminants-in-fish) identifies that the entirety of McKellar Lake is subject to a "Do not eat the fish" advisory due to chlordane, it is important to consider that these contaminants are likely sequestered in the sediments at the bottom of the lake. Similarly, the entirety of Cypress Creek is subject to a "Do not eat the fish" advisory due to chlordane and other pesticides and PCB's. The September 2014 report by the Mississippi River Conservation Committee (which includes TDEC and TWRA), titled, Summary of Available Water Quality Assessments of the Lower Mississippi River, compiled the available water quality assessments in the Lower Mississippi River. The report identifies that the recreation use of McKellar Lake "was impaired by chlordane, dioxin (including 2,3,7,8-TDCC) and PCBs from contaminated sediments and mercury from atmospheric deposition." The report also identifies that the fish and aquatic life use of McKellar Lake is "impaired by nitrogen and oxygen deficit caused by urban stormwater runoff and by siltation from dredging" carried out by the Memphis District Army Corps of Engineers. All of these are conditions that existed before the interceptor break occurred.

With the above concerns identified, a significant question is whether the removal of solids will do more harm than good. The Nonconnah Creek is impaired, according to the 2014 303(d) list, for PCBs, dioxins, and chlordane, among others. TDEC's TMDLs for Chlordane, Dioxins, and Polychlorinated Biphenyls (PCBs) in Nonconnah Creek (TDEC, 5/13/09) determined that, similar to the concerns identified above for McKellar Lake and Cypress Creek, contaminated sediment is "the primary source of chlordane, dioxins and PCBs in Nonconnah Creek." In the TMDL implementation plan, TDEC recognizes that more harm than good could result from resuspending these pollutants stating "There are generally two options to prevent chlordane, dioxins, and PCBs contained in the sediment from being released to the waterbody: 1) avoid disturbing the sediment or 2) remediate contaminated sites. TDEC recommends using option 1, whenever possible.

Thus, there is significant concern that removal of solids will result in more harm than good. It is suggested that, while other remediation actions proceed, removal of solids not occur. Additionally, it is recommended that TDEC reconsider the solids removal provision in the Notice of Violation.

Remove and dispose of the fish that have died due to this event

The City of Memphis engaged River Service, New Orleans Louisiana to find, remove and properly dispose of fish in the areas suggested by TDEC. The contractor deployed three 25 foot boats, two floating platforms for staging and six employees to recover the fish. The physical state of the fish, terrain and water levels made the task very difficult, however crews worked diligently to accomplish as much as possible. An update will also be provided to the public at the MLGW Neighborhood Advisory Council meeting scheduled on May 10, 2016.

Effectively communicate the health situation to the general public

The City of Memphis in coordination with the Health Department and Emergency Operations Center formed a joint task force with communications to the general public regarding the health situation being one of the primary objectives. The City of Memphis held a public meeting in the neighborhood near McKellar Lake on April 11, 2016 – Bloomfield Baptist Church. The City also engaged in door to door communication with each marina resident at McKellar Lake that was present shortly after the interceptor failure. The interagency response team that has been formed will continue to communicate with the public on an as needed basis.

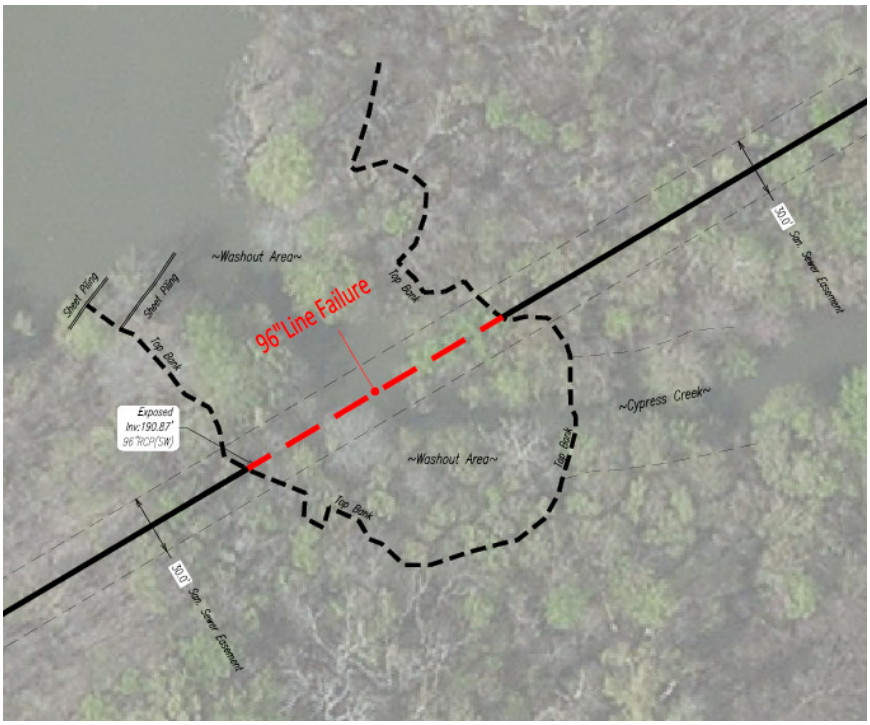

Figure 3. South Cypress Creek Area

Implementation Schedule

The proposed schedule for implementation of this plan is presented in Table 1. It is important to note that due to a number of unknown factors, the schedule may be subject to revision based upon project implementation logistics and results of data analysis, and coordination with the various parties involved in this project.

Table 1. Schedule of activities for implementation of remediation plan

Activity	Initiation Date	Frequency	Task Owner
Submittal of Plan	May 2, 2016	N/A	City of Memphis
Plan Revisions and Approval	May 9, 2016	N/A	TDEC
Kick-off call and identification monitoring locations	Week of May 9	N/A	All parties, coordinated by CDM/MWH
Baseline Monitoring Plan	May 16 - 20	3X during this week	B&V Led Team
Mobilization of SDOX and ancillary equipment systems	May 23 – 27	N/A	CDM/MWH Team to coordinate
Set-up and start-up of SDOX	May 30 – June 3	Continuous	CDM/MWH Team to coordinate
Continued Monitoring	May 25 – Project close	3X per week	B&V Led Team
TDEC update reports	June 1 – Project close	2X per month	City of Memphis supported by CDM/MWH Team
TDEC Meeting	June 1 – Project close	Monthly	City of Memphis supported by B&V and CDM/MWH

ATTACHMENT 2

NONCONNAH INTERCEPTOR STABILIZATION AT SOUTH CYPRESS CREEK

CITY PROJECT NO. SW02140

MEMPHIS, TENNESSEE

BID DATE : MAY 06,2016

A&H JOB #72020

DRAWING INDEX

BIDDERS ARE TO VISIT THE SITE AND FAMILIARIZE THEMSELVES WITH EXISTING CONDITIONS AND SATISFY THEMSELVES AS TO THE NATURE AND SCOPE OF THE WORK. THE SUBMISSION OF A BID WILL BE EVIDENCE THAT SUCH AN EXAMINATION HAS BEEN MADE. LATER CLAIMS FOR LABOR, EQUIPMENT, OR MATERIALS REQUIRED, OR FOR DIFFICULTIES ENCOUNTERED WHICH COULD HAVE BEEN FORESEEN HAD AN EXAMINATION BEEN MADE, WILL NOT BE ALLOWED.

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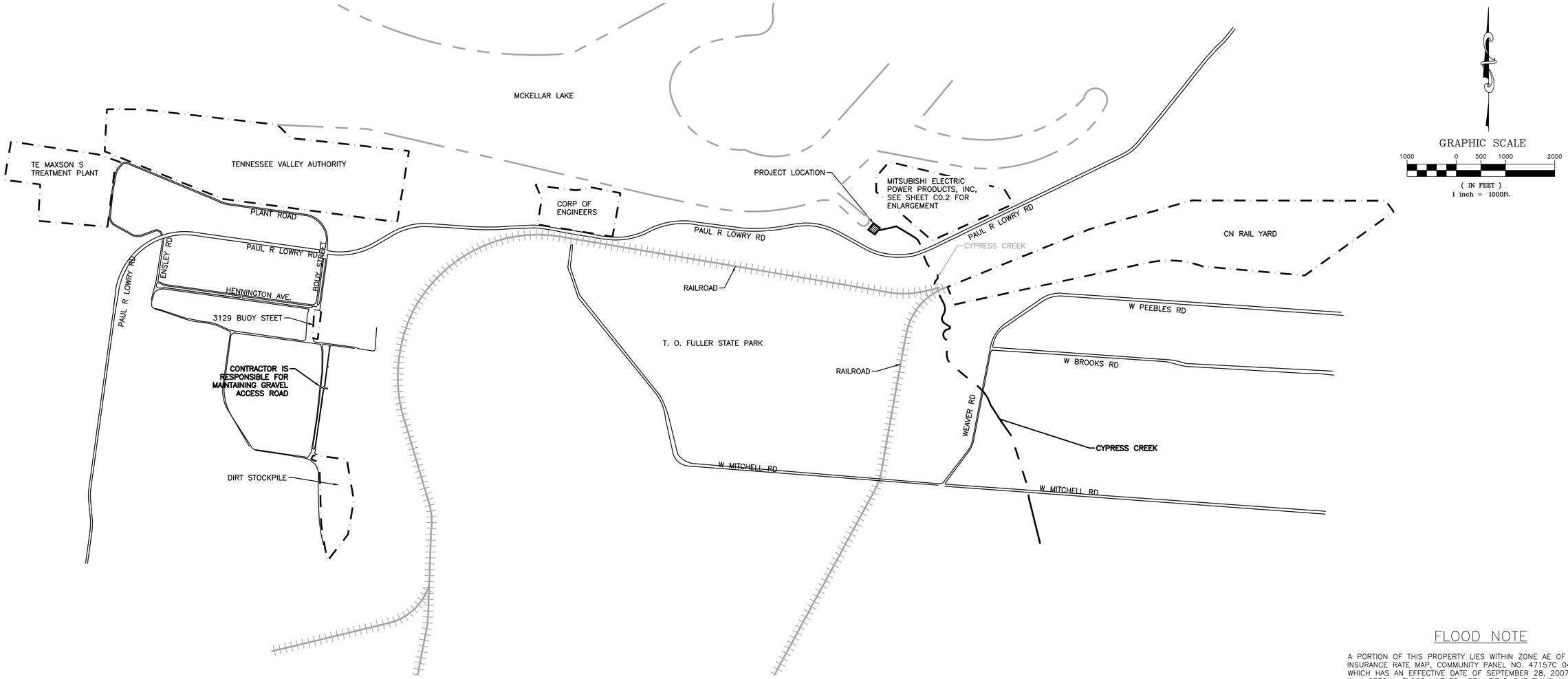
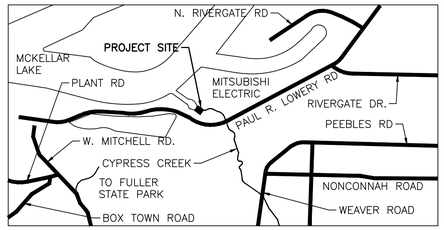


FLOOD NOTE

A PORTION OF THIS PROPERTY LIES WITHIN ZONE AE OF THE FLOOD INSURANCE RATE MAP, COMMUNITY PANEL NO. 47157C 0405 F WHICH HAS AN EFFECTIVE DATE OF SEPTEMBER 28, 2007 AND IS IN A SPECIAL FLOOD HAZARD AREA. FIELD SURVEYING WAS NOT PERFORMED TO DETERMINE THIS ZONE. THIS PROPERTY LIES WITHIN ZONE AE (THE FLOODWAY IS THE CHANNEL OF A STREAM PLUS ANY ADJACENT FLOODPLAIN AREAS THAT MUST BE KEPT FREE OF ENCROACHMENT SO THAT THE 1% ANNUAL CHANCE FLOOD CAN BE CARRIED WITHOUT SUBSTANTIAL INCREASES IN FLOOD HEIGHTS). AN ELEVATION CERTIFICATE MAY BE NEEDED TO VERIFY THIS DETERMINATION OR APPLY FOR AN AMENDMENT FROM THE FEDERAL EMERGENCY MANAGEMENT AGENCY. NO SURVEYING AND/OR ENGINEERING STUDY WAS PERFORMED FOR THIS OPINION.

BM NOTE

CITY OF MEMPHIS VERTICAL BENCHMARK # 748
GENERAL LOCATION: RIVERPORT RD. & S. RIVERGATE RD.
CITY MONUMENT IS LOCATED ON THE SE CORNER, 75' SOUTH OF B/CURB OF S. RIVERGATER RD AND 75' E OF B/CURB OF RIVERPORT RD., 89' SW OF P/POLE #74142, 13' E. OF E. TVA CENTERLINE
ELEVATION: 227.35' (NAVD88)



VICINITY MAP
NTS

SEWER BASIN: NO-1

ITEM NO.	REVISION DESCRIPTION OF CHANGE	APPROVAL DATE

Allen&Hoshall
1661 International Drive Memphis, TN 38120
901 820 0820 fax 901 683 1001

DIVISION OF ENGINEERING

NONCONNAH INTERCEPTOR STABILIZATION AT SOUTH CYPRESS CREEK

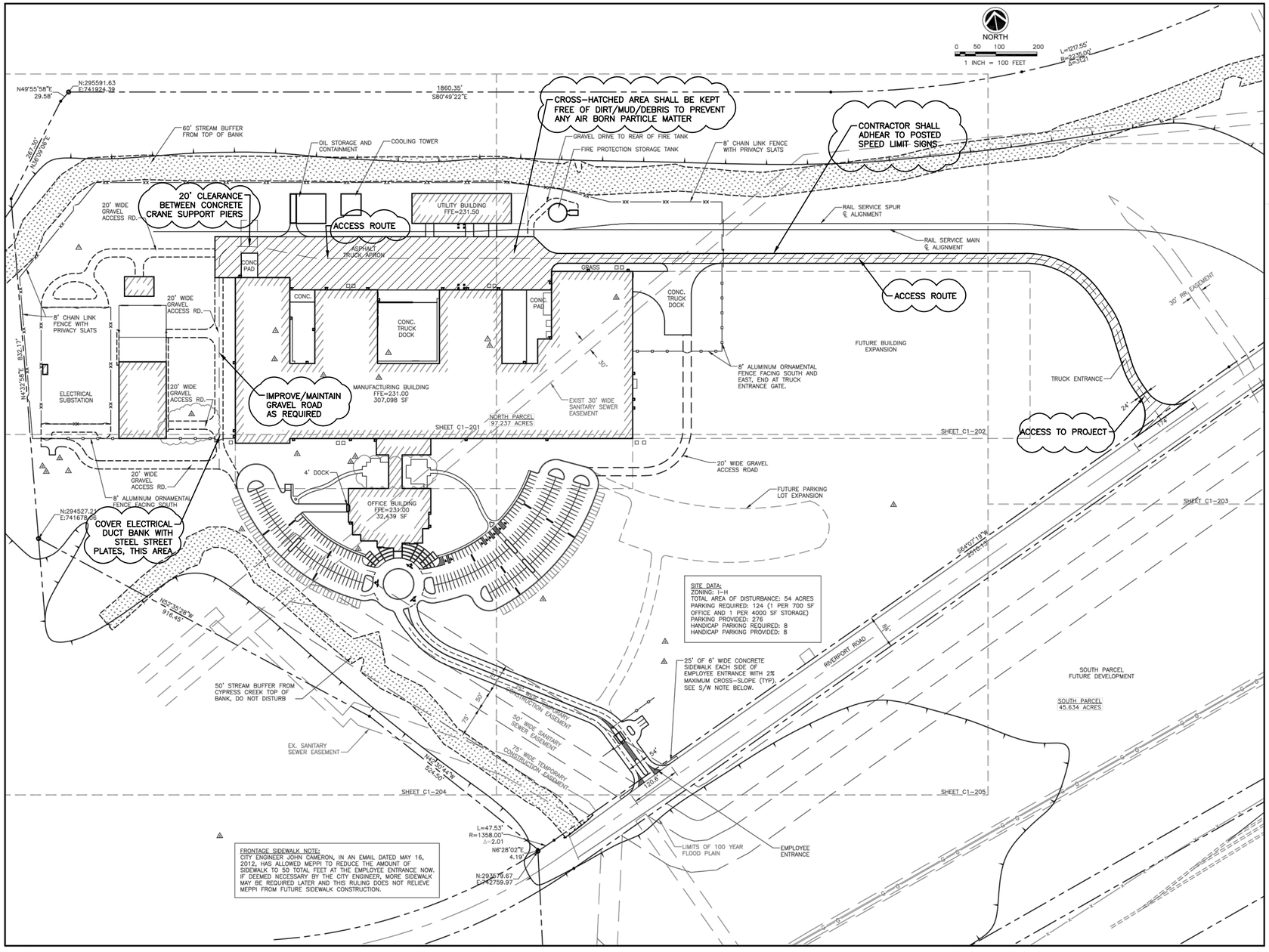
LOCATION: PAUL R. LOWRY ROAD MEMPHIS, TENNESSEE

STOCKPILE ACCESS PLAN

SURVEY: A&H DATE: 04.11.16 PROJECT NO.: 72020
DESIGN BY: CB DATE: 04.29.16 BOOK: N/A
DRAWN BY: CB DATE: 04.29.16 SCALE: AS SHOWN

APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE



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6775 Lenox Center Court, Suite 300
Memphis, TN 38115
901.758.0810

PICKERING JOB NO. 23939

SEAL:

KEY MAP:

DATE:	NO.	APPR	REVISION
7/27/11	A	AC	ISSUED FOR PERMIT
7/29/11	B	AC	REVISED FOR BIDS
8/26/11	0	AC	ISSUED FOR CONSTRUCTION; REVISED ELEC. YARD, PAVED AREAS IN BLDG FINGERS, DRAINAGE PIPES, SITE DETLS.
9/28/11	1	AC	CITY COMMENTS; PAVED AREAS, FIRE PROTECTION, GRAVEL DRIVES ADDED.
12/16/11	3	AC	SAN. SEWER & DRAIN ADJUSTMENTS; ADDED SW & CHECK VALVES ON FOG.
2/29/12	4	AC	REVISED SITE PLAN; ADDED ELECTRICAL SITE ITEMS; ADJUST GRADING.
5/23/12	5	AC	REGRADING; ELEC. SITE REVISIONS; ADD SHEETS C1-206, C1-207.
03/05/13	6	AC	ADDED ACCESS ROAD TO SPO

CLIENT:

MITSUBISHI ELECTRIC

MEMPHIS, TENNESSEE

DRAWING TITLE

PROJECT 21

CIVIL
SITE
PLAN
OVERALL

PROJECT LEADER:	A. CAMERON
DRAWN BY:	JML
DSGN. BY:	JWO
CHECKED BY:	CLM
O'NEAL JOB:	200900191
SCALE:	1"=100'
DATE:	JULY 18, 2011
CAD FILE:	200900191C1-200

SHEET:

C1-200

NOTES:

1. PLAN WAS PROVIDED BY MITSUBSHI ELECTRIC (MEPPI). ALLEN & HOSHALL MAKES NO GUARANTEES TO THE ACCURACY OF THE PROVIDED PLAN.
2. CLOUDED NOTES ARE RECOMMENDATIONS MADE BY ALLEN & HOSHALL

PROPOSED ACCESS ROUTE

FLOOD NOTE

A PORTION OF THIS PROPERTY LIES WITHIN ZONE AE OF THE FLOOD INSURANCE RATE MAP, COMMUNITY PANEL NO. 47157C 0405 F WHICH HAS AN EFFECTIVE DATE OF SEPTEMBER 28, 2007 AND IS IN A SPECIAL FLOOD HAZARD AREA. FIELD SURVEYING WAS NOT PERFORMED TO DETERMINE THIS ZONE. THIS PROPERTY LIES WITHIN ZONE AE (THE FLOODWAY IS THE CHANNEL OF A STREAM PLUS ANY ADJACENT FLOODPLAIN AREAS THAT MUST BE KEPT FREE OF ENCROACHMENT SO THAT THE 1% ANNUAL CHANCE FLOOD CAN BE CARRIED WITHOUT SUBSTANTIAL INCREASES IN FLOOD HEIGHTS). AN ELEVATION CERTIFICATE MAY BE NEEDED TO VERIFY THIS DETERMINATION OR APPLY FOR AN AMENDMENT FROM THE FEDERAL EMERGENCY MANAGEMENT AGENCY. NO SURVEYING AND/OR ENGINEERING STUDY WAS PERFORMED FOR THIS OPINION.

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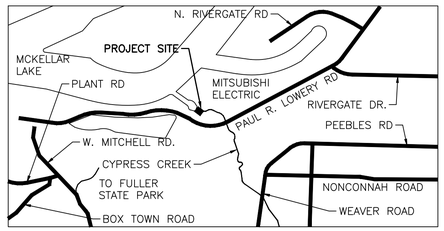

VICINITY MAP
NTS

SEWER BASIN: NO-1

ITEM NO.	REVISION DESCRIPTION OF CHANGE	APPROVAL DATE

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DIVISION OF ENGINEERING

NONCONNAH INTERCEPTOR STABILIZATION AT SOUTH CYPRESS CREEK

LOCATION: PAUL R. LOWRY ROAD MEMPHIS, TENNESSEE

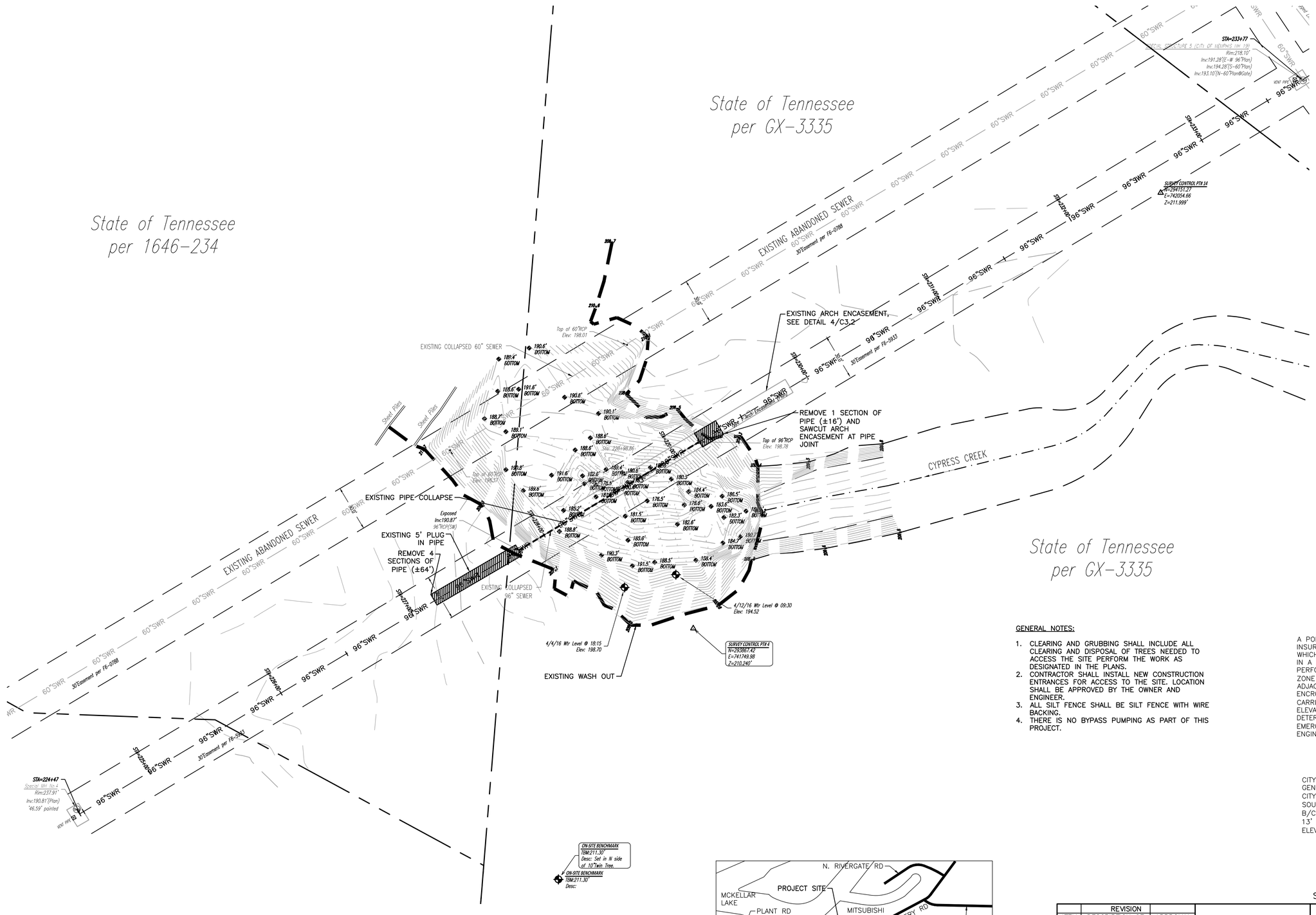
MEPPI ACCESS PLAN

SURVEY: A&H	DATE: 04.11.16	PROJECT NO.: 72020
DESIGN BY: CB	DATE: 04.29.16	BOOK: N/A
DRAWN BY: CB	DATE: 04.29.16	SCALE: NOT TO SCALE

APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

PROJECT NO: SW02140 FILE NO: ____ SHEET: C0.2



GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

1 inch = 30 ft.

NOTES:

1. LOCATION OF EXISTING UNDERGROUND UTILITIES ARE APPROXIMATE AND ARE NOT NECESSARILY ALL WHICH MAY EXIST ON THE PROJECT SITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING THE APPROPRIATE UTILITY COMPANY TO DETERMINE THE EXACT LOCATION OF ALL UTILITIES AND/OR UNDERGROUND STRUCTURES PRIOR TO THE INITIATION OF ANY CONSTRUCTION. CONTRACTOR SHALL ALSO ASSUME FULL RESPONSIBILITY FOR DAMAGE TO ANY UTILITIES ENCOUNTERED WITHIN CONSTRUCTION PERIMETERS.
2. FOR UNDERGROUND UTILITY LOCATIONS CALL 1-800-351-1111
3. FIELD VERIFY EXISTING GRADES AND COMPARE WITH THIS SHEET. REPORT ALL DISCREPANCIES TO THE ENGINEER PRIOR TO STARTING CONSTRUCTION OPERATIONS.

GENERAL NOTES:

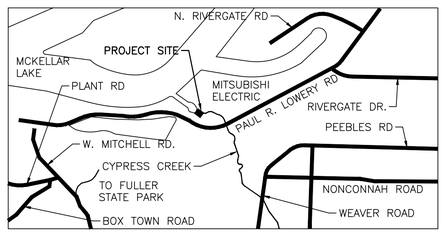
1. CLEARING AND GRUBBING SHALL INCLUDE ALL CLEARING AND DISPOSAL OF TREES NEEDED TO ACCESS THE SITE PERFORM THE WORK AS DESIGNATED IN THE PLANS.
2. CONTRACTOR SHALL INSTALL NEW CONSTRUCTION ENTRANCES FOR ACCESS TO THE SITE. LOCATION SHALL BE APPROVED BY THE OWNER AND ENGINEER.
3. ALL SILT FENCE SHALL BE SILT FENCE WITH WIRE BACKING.
4. THERE IS NO BYPASS PUMPING AS PART OF THIS PROJECT.

FLOOD NOTE

A PORTION OF THIS PROPERTY LIES WITHIN ZONE AE OF THE FLOOD INSURANCE RATE MAP, COMMUNITY PANEL NO. 47157C 0405 F WHICH HAS AN EFFECTIVE DATE OF SEPTEMBER 28, 2007 AND IS IN A SPECIAL FLOOD HAZARD AREA. FIELD SURVEYING WAS NOT PERFORMED TO DETERMINE THIS ZONE. THIS PROPERTY LIES WITHIN ZONE AE (THE FLOODWAY IS THE CHANNEL OF A STREAM PLUS ANY ADJACENT FLOODPLAIN AREAS THAT MUST BE KEPT FREE OF ENCROACHMENT SO THAT THE 1% ANNUAL CHANCE FLOOD CAN BE CARRIED WITHOUT SUBSTANTIAL INCREASES IN FLOOD HEIGHTS). AN ELEVATION CERTIFICATE MAY BE NEEDED TO VERIFY THIS DETERMINATION OR APPLY FOR AN AMENDMENT FROM THE FEDERAL EMERGENCY MANAGEMENT AGENCY. NO SURVEYING AND/OR ENGINEERING STUDY WAS PERFORMED FOR THIS OPINION.

BM NOTE

CITY OF MEMPHIS VERTICAL BENCHMARK # 748
GENERAL LOCATION: RIVERPORT RD. & S. RIVERGATE RD.
CITY MONUMENT IS LOCATED ON THE SE CORNER, 75' SOUTH OF B/CURB OF S. RIVERGATER RD AND 75' E OF B/CURB OF RIVERPORT RD., 89' SW OF P/POLE #74142, 13' E. OF E. TVA CENTERLINE
ELEVATION: 227.35' (NAVD88)



VICINITY MAP
NTS

SEWER BASIN: NO-1

SHEET 4 OF 9

ITEM NO.	REVISION DESCRIPTION OF CHANGE	APPROVAL DATE

Allen&Hoshall
1661 International Drive Memphis, TN 38120
901 820 0820 fax 901 683 1001

DIVISION OF ENGINEERING

NONCONNAH INTERCEPTOR STABILIZATION AT SOUTH CYPRESS CREEK

LOCATION: PAUL R. LOWRY ROAD MEMPHIS, TENNESSEE

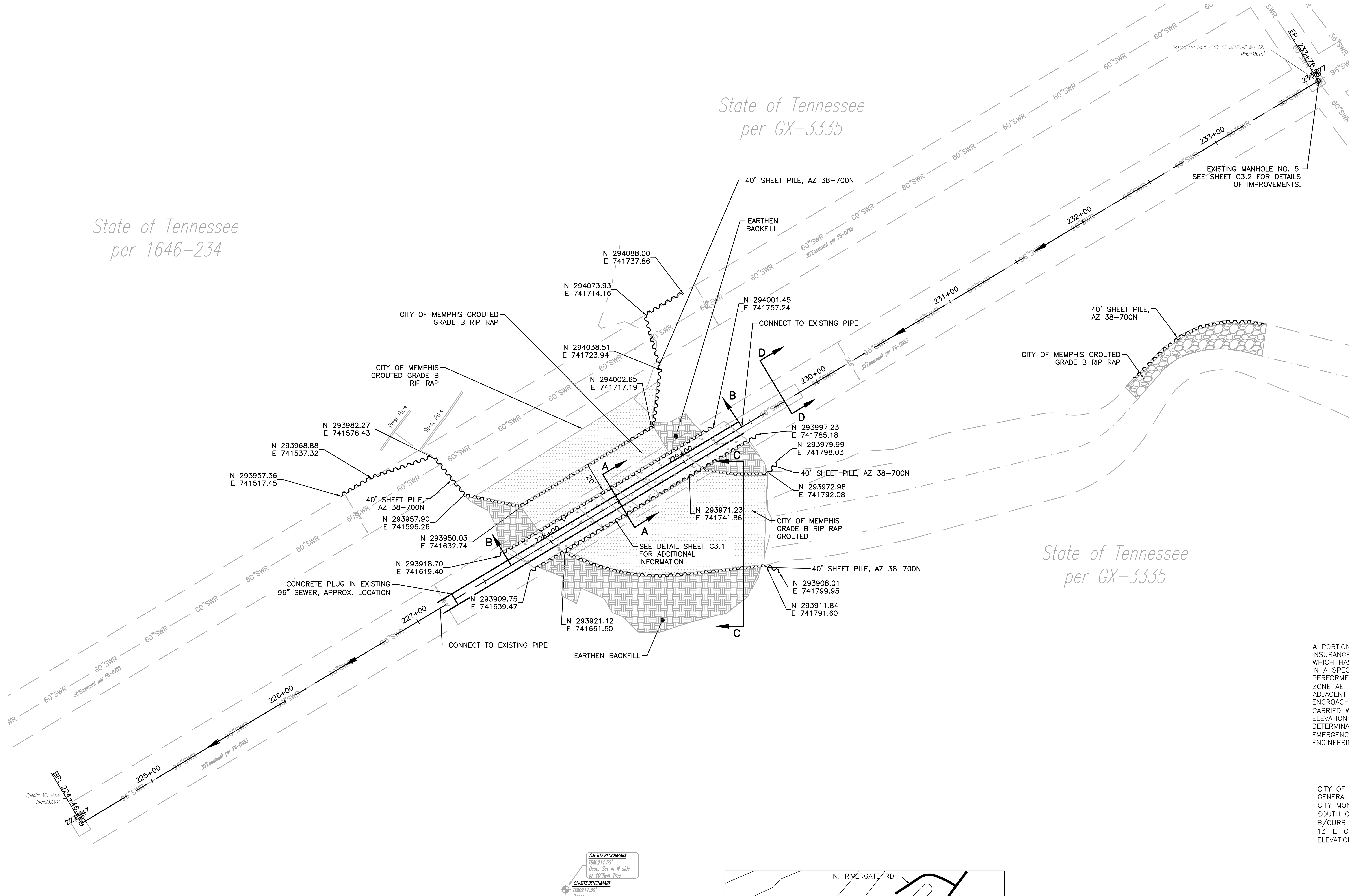
EXISTING CONDITIONS AND DEMO

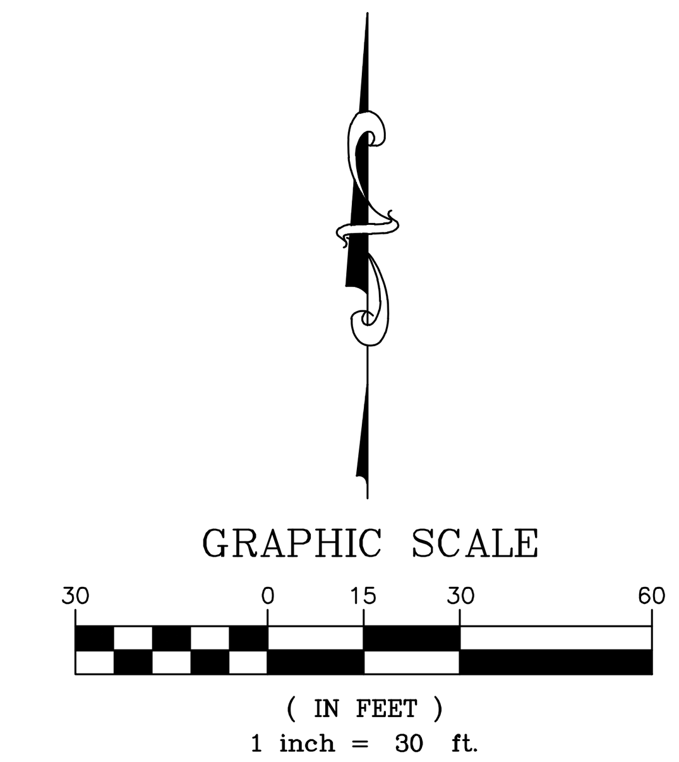
SURVEY: A&H DATE: 04.11.16 PROJECT NO.: 72020
DESIGN BY: CB DATE: 04.29.16 BOOK: N/A
DRAWN BY: CB DATE: 04.29.16 SCALE: AS SHOWN

APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

PROJECT NO: SW02140 FILE NO: SHEET: C0.3





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3. FIELD VERIFY EXISTING GRADES AND COMPARE WITH THIS SHEET. REPORT ALL DISCREPANCIES TO THE ENGINEER PRIOR TO STARTING CONSTRUCTION OPERATIONS.
4. ALL EARTHEN MATERIAL BEHIND SHEET PILE SHALL BE COMPACTED TO 90 PERCENT STANDARD PROCTOR. CITY WILL PROVIDE CONTRACTOR WITH BORROW MATERIAL. CONTRACTOR SHALL MOVED BORROW MATERIAL FROM THE LOCATION AS SHOWN ON SHEET C0.1 AND COMPACT ONSITE.
5. ALL AREAS DISTURBED BY CONSTRUCTION WITHIN 60' OF THE EXISTING WASHOUT THAT ARE NOT PAVED OR RIPRAP SHALL BE STABILIZED WITH LOVE GRASS AND COVERED WITH ENKAMAT OR APPROVED EQUAL. ALL OTHER AREAS DISTURBED BY CONSTRUCTION SHALL BE STABILIZED WITH BERMUDA.
6. ALL SHEET PILE SHALL BE AZ 38-700N SHEET PILE, Fy=60 KSI. SHEET PILE SHALL BE CUT OFF FLUSH WITH GROUND ELEVATION.

FLOOD NOTE

A PORTION OF THIS PROPERTY LIES WITHIN ZONE AE OF THE FLOOD INSURANCE RATE MAP, COMMUNITY PANEL NO. 47157C 0405 F WHICH HAS AN EFFECTIVE DATE OF SEPTEMBER 28, 2007 AND IS IN A SPECIAL FLOOD HAZARD AREA. FIELD SURVEYING WAS NOT PERFORMED TO DETERMINE THIS ZONE. THIS PROPERTY LIES WITHIN ZONE AE (THE FLOODWAY IS THE CHANNEL OF A STREAM PLUS ANY ADJACENT FLOODPLAIN AREAS THAT MUST BE KEPT FREE OF ENCROACHMENT SO THAT THE 1% ANNUAL CHANCE FLOOD CAN BE CARRIED WITHOUT SUBSTANTIAL INCREASES IN FLOOD HEIGHTS). AN ELEVATION CERTIFICATE MAY BE NEEDED TO VERIFY THIS DETERMINATION OR APPLY FOR AN AMENDMENT FROM THE FEDERAL EMERGENCY MANAGEMENT AGENCY. NO SURVEYING AND/OR ENGINEERING STUDY WAS PERFORMED FOR THIS OPINION.

BM NOTE

CITY OF MEMPHIS VERTICAL BENCHMARK # 748
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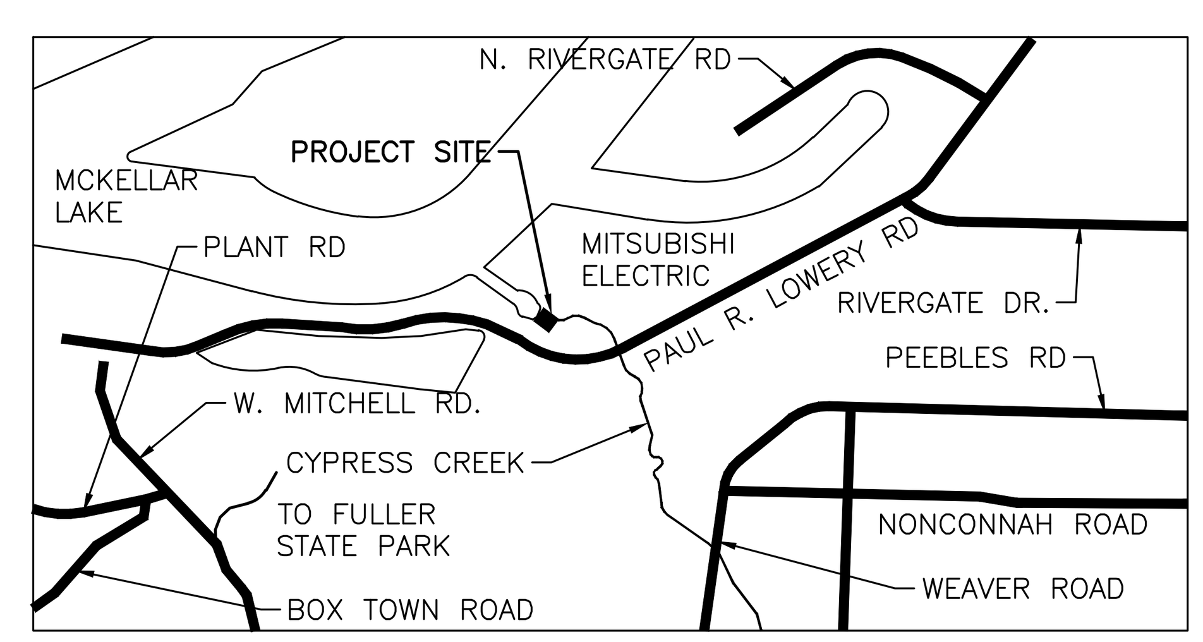

VICINITY MAP
NTS

SEWER BASIN: NO-1
SHEET 5 OF 9

REVISION		
ITEM NO.	DESCRIPTION OF CHANGE	APPROVAL DATE

Allen&Hoshall
1661 International Drive Memphis, TN 38120
901 820 0820 fax 901 683 1001

DIVISION OF ENGINEERING
NONCONNAH INTERCEPTOR STABILIZATION AT SOUTH CYPRESS CREEK
LOCATION: PAUL R. LOWRY ROAD MEMPHIS, TENNESSEE

OVERALL SITE PLAN

SURVEY: A&H DATE: 04.11.16 PROJECT NO.: 72020
DESIGN BY: CB DATE: 04.29.16 BOOK: N/A
DRAWN BY: CB DATE: 04.29.16 SCALE: AS SHOWN

APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

PROJECT NO: SW02140 FILE NO: SHEET: C1.1

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)
1 inch = 30 ft.

NOTES:

1. LOCATION OF EXISTING UNDERGROUND UTILITIES ARE APPROXIMATE AND ARE NOT NECESSARILY ALL WHICH MAY EXIST ON THE PROJECT SITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING THE APPROPRIATE UTILITY COMPANY TO DETERMINE THE EXACT LOCATION OF ALL UTILITIES AND/OR UNDERGROUND STRUCTURES PRIOR TO THE INITIATION OF ANY CONSTRUCTION. CONTRACTOR SHALL ALSO ASSUME FULL RESPONSIBILITY FOR DAMAGE TO ANY UTILITIES ENCOUNTERED WITHIN CONSTRUCTION PERIMETERS.
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6. CONTRACTOR SHALL INSTALL SILT FENCE AND MEET ALL EROSION CONTROL MEASURES AND REQUIREMENTS SET FORTH BY THE TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION AND THE ARMY CORPS OF ENGINEERS.
7. ALL SHEET PILE SHALL BE AZ 38-700N SHEET PILE, Fy=60 KSI. SHEET PILE SHALL BE CUT OFF FLUSH WITH GROUND ELEVATION.

FLOOD NOTE

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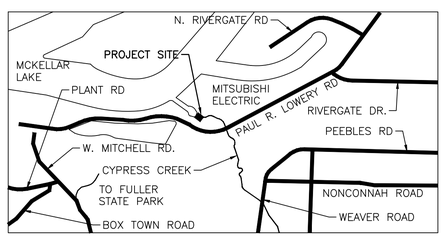


VICINITY MAP
NTS

SEWER BASIN: NO-1

SHEET 6 OF 9

ITEM NO.	REVISION DESCRIPTION OF CHANGE	APPROVAL DATE

Allen&Hoshall
1661 International Drive Memphis, TN 38120
901 820 0820 fax 901 683 1001

DIVISION OF ENGINEERING

NONCONNAH INTERCEPTOR STABILIZATION AT SOUTH CYPRESS CREEK

LOCATION: PAUL R. LOWRY ROAD MEMPHIS, TENNESSEE

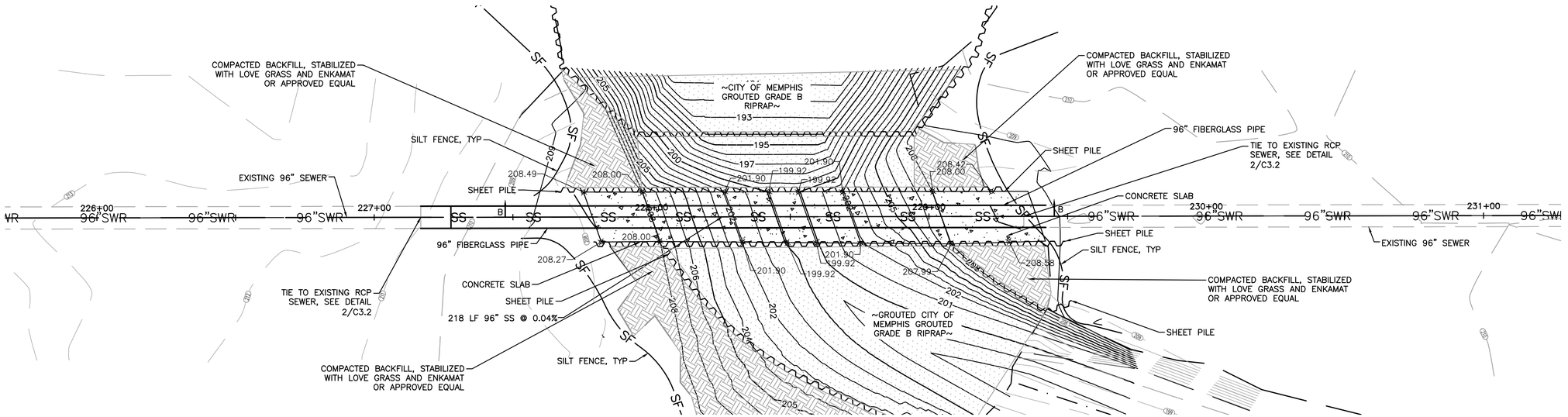
OVERALL GRADING PLAN

SURVEY: A&H DATE: 04.11.16 PROJECT NO.: 72020
DESIGN BY: CB DATE: 04.29.16 BOOK: N/A
DRAWN BY: CB DATE: 04.29.16 SCALE: AS SHOWN

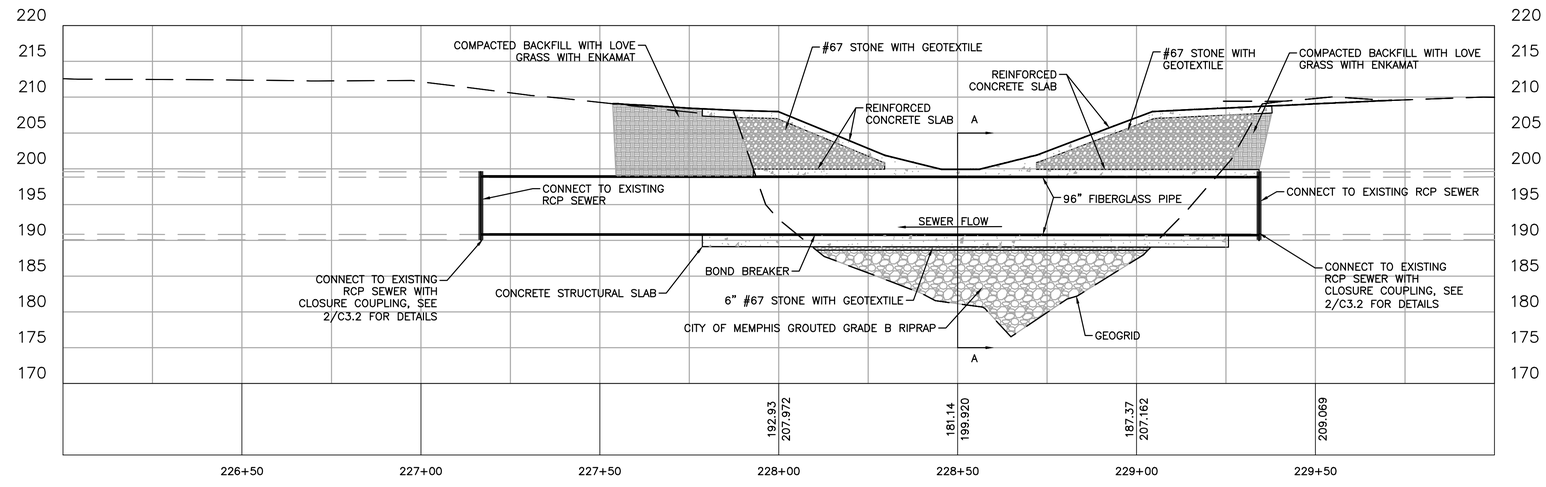
APPROVED

DEPUTY CITY ENGINEER ____ DATE ____ CITY ENGINEER ____ DATE ____

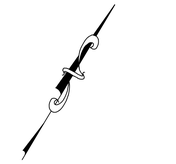
PROJECT NO: SW02140 FILE NO: ____ SHEET: C2.1



PLAN VIEW
SCALE: 1"=20'



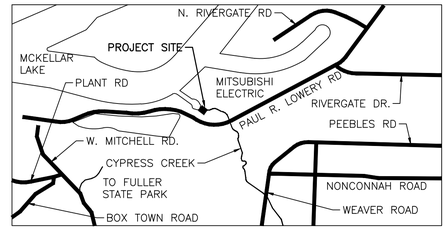
PROFILE VIEW SECTION B–B
SCALE: H:1"=20'; V:1"=10'



GRAPHIC SCALE

20 0 10 20 40

(IN FEET)
1 inch = 20 ft.



VICINITY MAP
NTS

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ELEVATION: 227.35' (NAVD88)

SEWER BASIN: NO–1

ITEM NO.	REVISION DESCRIPTION OF CHANGE	APPROVAL DATE

Allen&Hoshall
1661 International Drive Memphis, TN 38120
901 820 0820 fax 901 683 1001

DIVISION OF ENGINEERING

NONCONNAH INTERCEPTOR STABILIZATION AT SOUTH CYPRESS CREEK

LOCATION: PAUL R. LOWRY ROAD MEMPHIS, TENNESSEE

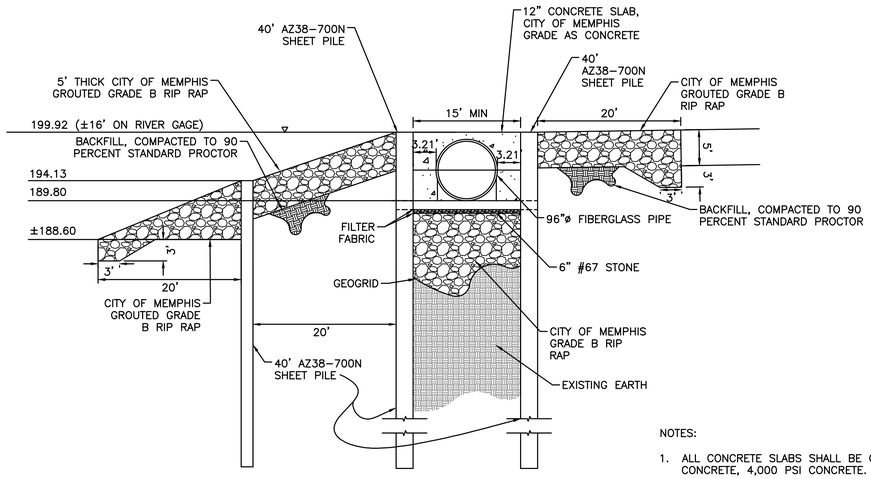
PLAN AND PROFILE
STA. 226+00 TO 230+00

SURVEY: A&H DATE: 04.11.16 PROJECT NO.: 72020
DESIGN BY: CB DATE: 04.29.16 BOOK: N/A
DRAWN BY: CB DATE: 04.29.16 SCALE: AS SHOWN

APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

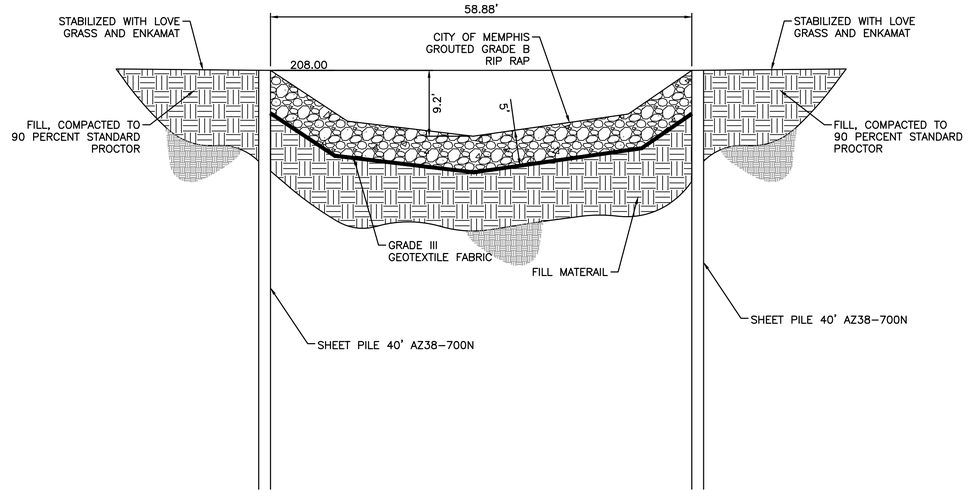
PROJECT NO: SW02140 FILE NO: SHEET: C2.2



NOTES:

1. ALL CONCRETE SLABS SHALL BE CITY OF MEMPHIS TYPE "AS" CONCRETE, 4,000 PSI CONCRETE.
2. ALL RIP RAP SHALL BE CITY OF MEMPHIS GRADE B RIP RAP, WITH 5' MINIMUM THICKNESS.
3. RIP RAP SHALL BE GROUTED AS PER PLANS.
4. BACKFILL AROUND THE PIPE AND BELOW CONCRETE SLABS SHALL BE CITY OF MEMPHIS GRADE "AS" CONCRETE. BOND BREAKERS SHALL BE PROVIDED AROUND THE PIPE AND AT CONCRETE SLAB AND CONCRETE BACKFILL INTERFACES.
5. ALL SHEET PILE SHALL BE AZ 38-700N SHEET PILE, Fy=60 KSI. SHEET PILE SHALL BE CUT OFF FLUSH WITH CONCRETE.

1 / C3.1 SECTION A-A
SCALE: 1"=10'



2 / C3.1 SECTION C-C
SCALE: 1"=10'

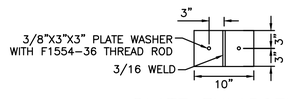
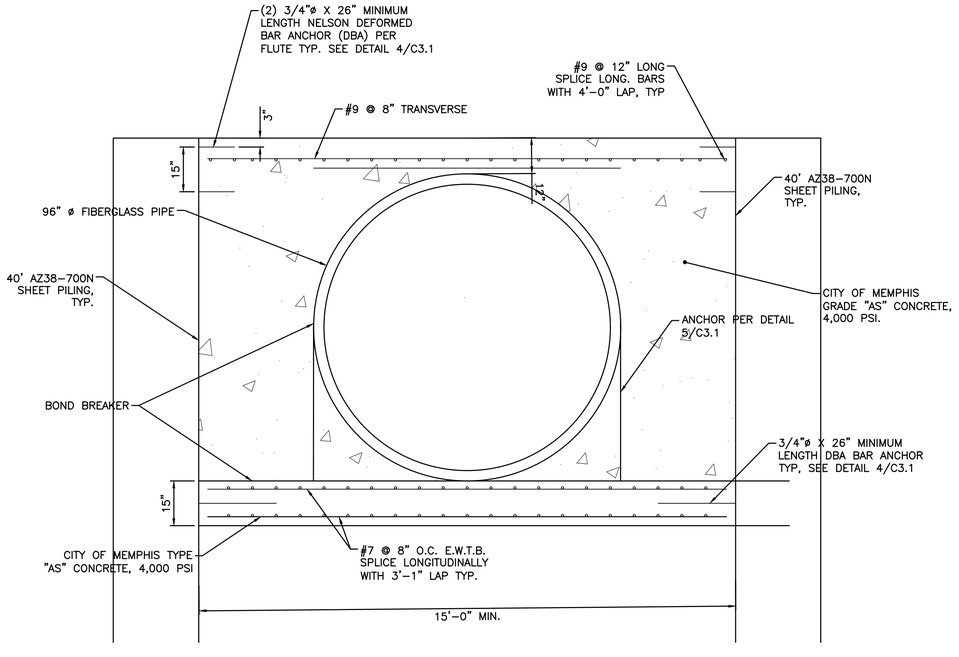
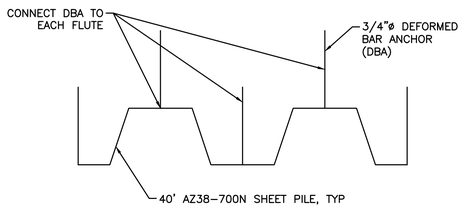


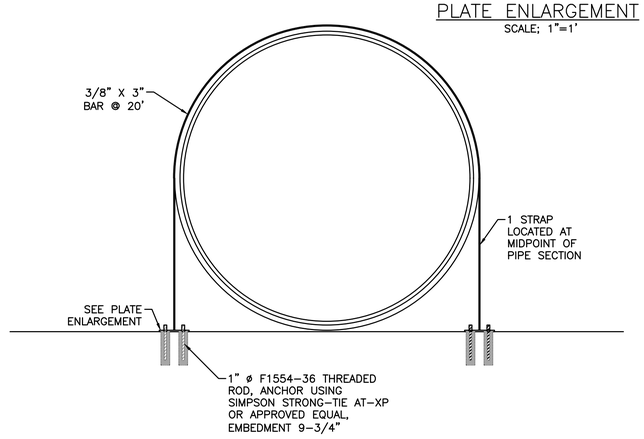
PLATE ENLARGEMENT
SCALE; 1"=1'



3 / C3.1 CONCRETE REINFORCING
SCALE: 1"=2'



4 / C3.1 DEFORMED ANCHOR BAR
SCALE: 1"=2'



5 / C3.1 PIPE ANCHOR DETAIL
SCALE: 1"=2'

SEWER BASIN: NO-1

ITEM NO.	REVISION DESCRIPTION OF CHANGE	APPROVAL DATE

Allen&Hoshall
1661 International Drive Memphis, TN 38120
901 820 0820 fax 901 683 1001

DIVISION OF ENGINEERING

NONCONNAH INTERCEPTOR STABILIZATION AT SOUTH CYPRESS CREEK

LOCATION: PAUL R. LOWRY ROAD MEMPHIS, TENNESSEE

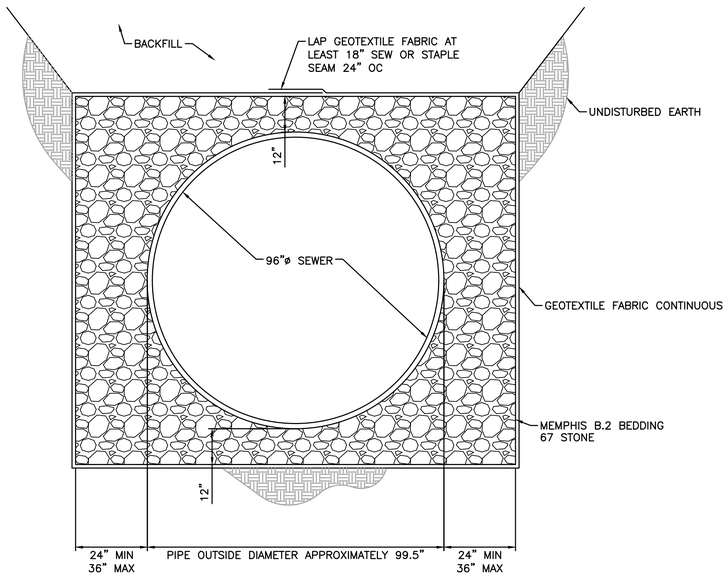
DETAILS

SURVEY: A&H DATE: 04.11.16 PROJECT NO.: 72020
DESIGN BY: CB DATE: 04.29.16 BOOK: N/A
DRAWN BY: CB DATE: 04.29.16 SCALE: AS SHOWN

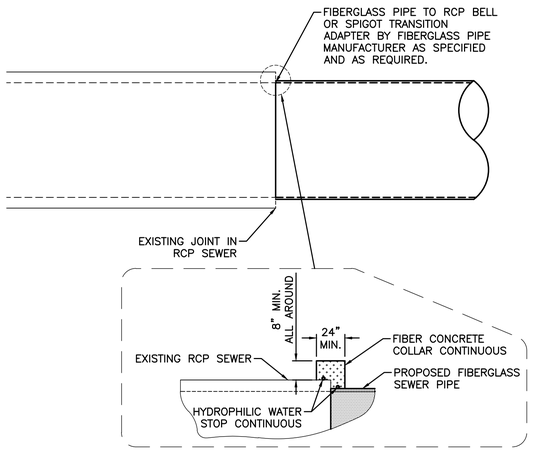
APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

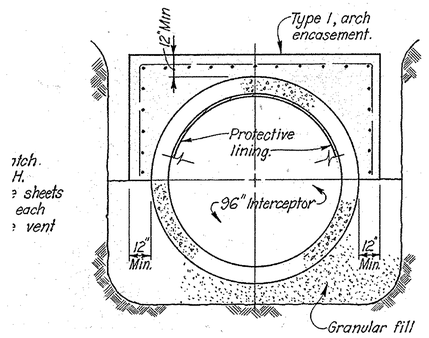
PROJECT NO: SW02140 FILE NO: SHEET: C3.1



1 C3.2 PIPE BEDDING DETAIL
SCALE: 1"=2'



2 C3.2 PIPE CONNECTION DETAIL
SCALE: 1"=5'

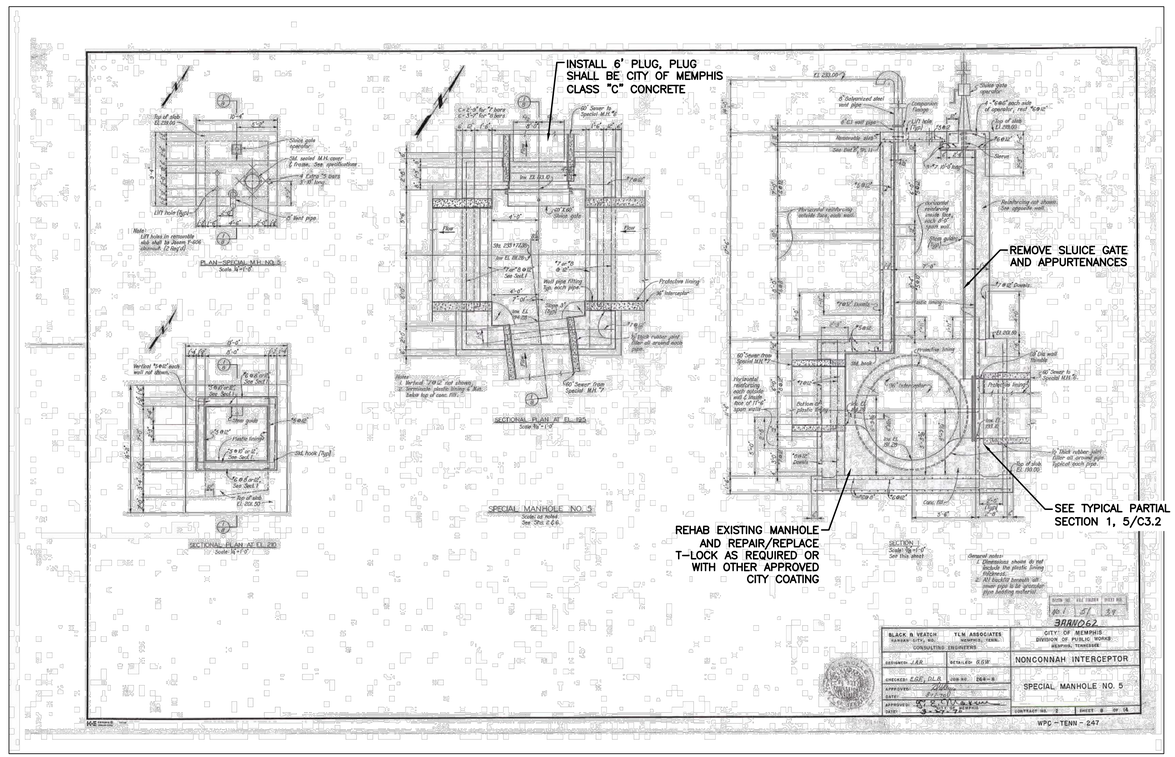


TYPE I ARCH ENCASEMENT DETAIL
Scale: 1/4"=1'-0"
See Shs. 2 & 5

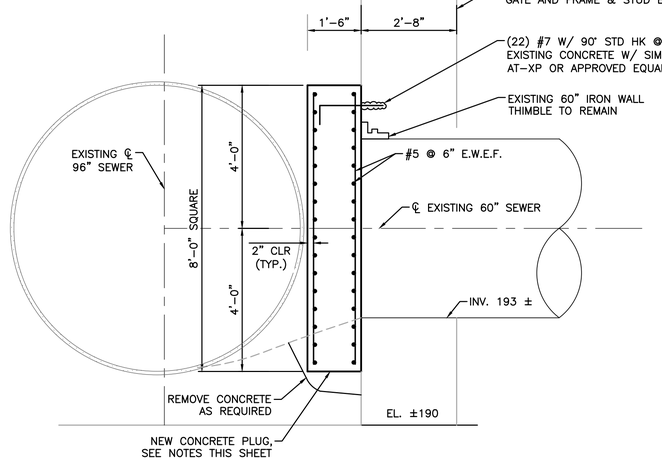
ARCH ENCASEMENT AS SHOWN ON ORIGINAL CONSTRUCTION DRAWINGS

Notes:
1. All reinforcing shown is #6@12".
2. Arch encasement may be poured to full width of trench.
3. Provide construction joints in conc. encasement at not to exceed 36'-0" spacing. Stop all reinf. steel each side of joint so that reinforcement is discontinuous at each construction joint. Each construction joint is to be located at a pipe joint.

4 C3.2 SECTION D-D
N.T.S.



3 C3.2 EXISTING SPECIAL MANHOLE 5 (CITY OF MEMPHIS MANHOLE 19) DETAIL
SCALE: NTS



NOTES:
1. REMOVE EXISTING 60" X 60" SLUICE GATE AND ACCESSORIES.
2. REMOVE EXISTING T-LOC LINER FROM ENTIRE STRUCTURE.
3. CLEAN AND ROUGHEN CONCRETE AT NEW PLUG.
4. INSTALL NEW PLUG AS INDICATED.
5. PROVIDE PROTECTIVE COATING OF ALL INTERIOR CONCRETE SURFACES, NEW AND EXISTING, SEE SPECIFICATION SECTION 09920.

5 C3.2 TYPICAL PARTIAL SECTION 1
N.T.S.

SEWER BASIN: NO-1

SHEET 9 OF 9

REVISION		
ITEM NO.	DESCRIPTION OF CHANGE	APPROVAL DATE

Allen&Hoshall
1661 International Drive Memphis, TN 38120
901 820 0820 fax 901 683 1001

DIVISION OF ENGINEERING

NONCONNAH INTERCEPTOR STABILIZATION AT SOUTH CYPRESS CREEK

LOCATION: PAUL R. LOWRY ROAD MEMPHIS, TENNESSEE

DETAILS

SURVEY: A&H DATE: 04.11.16 PROJECT NO.: 72020
DESIGN BY: CB DATE: 04.29.16 BOOK: N/A
DRAWN BY: CB DATE: 04.29.16 SCALE: AS SHOWN

APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

PROJECT NO: SW02140 FILE NO: ___ SHEET: C3.2

ATTACHMENT 3

BROPHY – HEINEKE & ASSOCIATES, INC.

April 29, 2016

Mr. Scott Morgan (Scott.Morgan@memphistn.gov)
City of Memphis
Division of Public Works
125 North Main Street, Suite 620
Memphis, Tennessee 38103

RE: Environmental Investigation
Nonconnah Interceptor Stabilization at Cypress Creek
Memphis, Shelby County, Tennessee

Dear Mr. Morgan:

On April 26, 2016, field investigations were completed for the Nonconnah Interceptor Stabilization project. The subject site is located along the segment of the Nonconnah Interceptor sewer located north of Riverport Road and adjacent to Cypress Creek. For further reference, a site location map based upon the Southwest, Tennessee USGS topographic quadrangle is enclosed. A Wetland Location Map indicating the assessed area is also enclosed. The purpose of the investigations was to assess the site for wetlands and other "waters" subject to §404/§401 regulations by the U.S. Army Corps of Engineers (Corps) and/or the Tennessee Department of Environment and Conservation (TDEC) Division of Water Resources. The inspections were conducted in accordance with the methodology of the *2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region.*

At the time of the investigations, efforts were underway to repair the damaged sewer line. It was noted that a previously delineated wetland of 18,909 square feet / 0.43 acre had been partially impacted by the repair work. This wetland (Wetland 1) is located near the pumping bypass on the northern side of Cypress Creek, just south of Mitsubishi, at approximate coordinates of N35.071326°/W90.099297°. The wetland area appears to have remained consistent in size; however, due to the recent disturbance the wetland was not delineated at this time.

Three additional areas meeting the jurisdictional definition of a wetland were delineated south of Wetland 1. This area had not been disturbed. Vegetation within the wetlands was dominated by hackberry (*Celtis laevigata*), eastern cottonwood (*Populus deltoides*), Gray's sedge (*Carex grayi*), Frank's sedge (*Carex frankii*), and white panicled American-aster (*Symphotrichum lanceolatum*). Each of the three delineated wetlands was under 0.10 acre. However, the wetlands will need to be surveyed and mapped in order to determine their exact acreages. An aerial map indicating the locations of the wetlands has been provided for your reference. A Flagging Key containing coordinates for the locations of each of the wetlands is also provided.

No wetlands were observed within the portion of the alignment located south of Cypress Creek. As the southern section of the alignment was highly disturbed at the time of the investigation, this assessment is based upon conditions observable within the nearest adjacent vegetated areas.

(901) 373-3289

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Other than Cypress Creek, no additional stream channels were identified within the investigated area.

Representatives from the Corps will need to make the final determination on the federal regulatory status of potentially jurisdictional features on the site. Once the delineated wetland acreages have been mapped and surveyed, we will secure a preliminary jurisdictional determination (PJD) from the Corps of Engineers for this section of the sewer alignment.

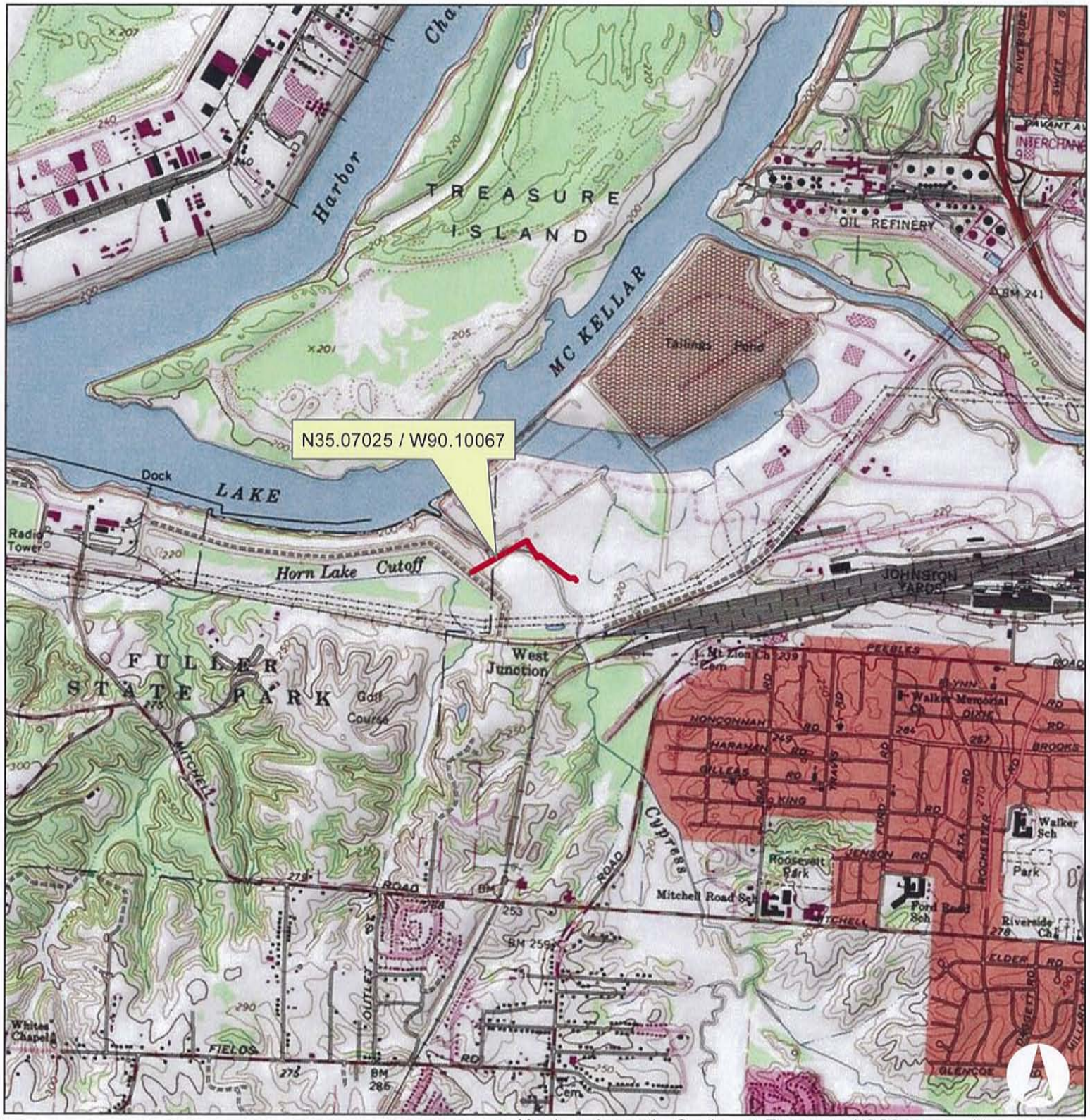
Should you have any questions about this report, please contact me at (901) 373-3289 or via email at jlmorrison@bellsouth.net.

Best regards,

Jennifer Morrison

Jennifer Morrison
Wetland Scientist

Nonconnah Interceptor Stabilization Project
Location Map



Map based upon the Southwest, Tennessee USGS topographic quadrangle

0 750 1,500 3,000 4,500

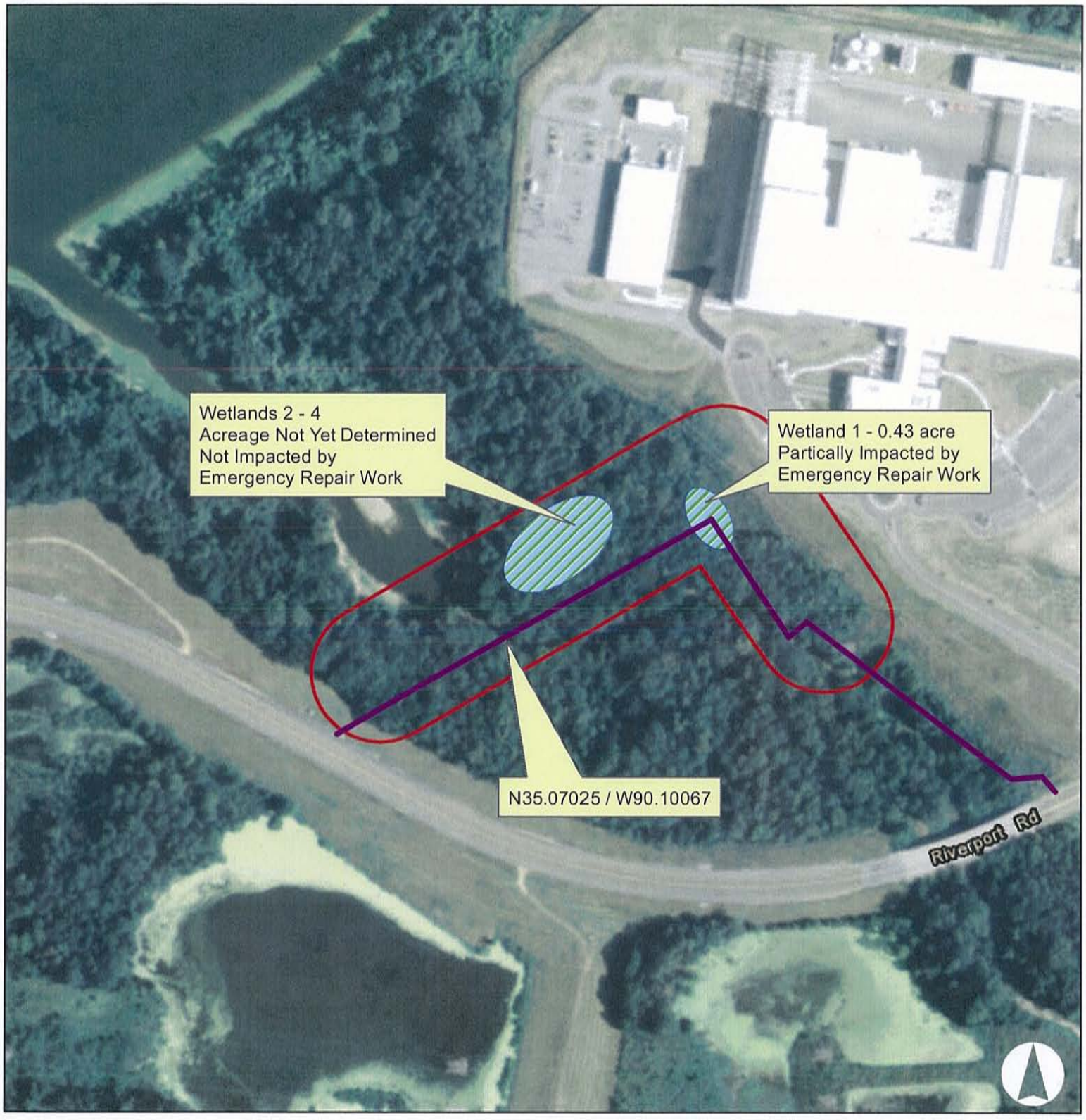
Feet

1:24,000

Legend

Alignment

Nonconnah Interceptor Stabilization Project
Wetland Location Map



0 100 200 400 600
Feet

1:3,500

Existing Sewer Line
Investigated Area
Wetlands

Nonconnah Interceptor Stabilization at South Cypress Creek
Environmental Assessment

Wetland Flagging Key

Wetland	Flag Line Numbers	Flag Starting Location	Notes
1	previously delineated	N35.07132°, W90.09929°	18,909 square feet
2	2-1 to 2-11	N35.07064°, W90.10069°	near Cypress Creek
3	3-1 to 3-7	N35.07109°, W90.10014°	south of Wetland 1
4	4-1 to 4-7	N35.07106°, W90.10018°	adjacent to Wetland 3